



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In application of:

MATSUDA et al.:

Examiner: Jennifer A Boyd

Serial No. 09/889,508:

Group Art Unit: 1771

Filed on October 18, 2001:

For: FLAME-RETARDANT POLYESTER FIBER, WOVEN OR KNITTED FLAME-RETARDANT POLYESTER FIBER FABBRIC, NONWOVEN FLAME-RETARDANT POLYESTER FIBER FABBRIC AND WOVEN OR KNITTED SUEDEFABRIC:

DECLARATION UNDER 37 CFR 1,132

Honorable Commissioner of
Patents and Trademarks,
Washington, D.C. 20231

Sir:

I, Ryouji Nakamura, declare that I am a citizen of Japan, whose post office address is c/o Toyo Boseki Kabushiki Kaisha, Research Institute, 1-1, Katata 2-chome, Ohtsu-shi, Shiga 520-0243 Japan;

That my education and employment history is as follows:

In March 1965, I graduated from Nara Prefectural Nara Shou-Kou High School, machinery course,

I was employed by Toyo Boseki Kabushiki Kaisha In March 1965, and, since then, I have been engaged in the research and development relating to spinning, warp knitting, spinning of synthetic fiber (particularly polyester filament) and the like,

That I have fully understood the subject matter of the above-identified U.S. patent application SN 09/889,508 and the subject matter of the cited reference, Endo et al.;

That I conducted the following experiment to establish that, when the take-up speed is outside the range defined in the present application, a fiber capable of satisfying all the formulas 1, 2 and 3 in claim 1 of the present application cannot be obtained, and conducted an experiment to reproduce Example 10 of Endo et al to give a fiber, and measured the properties of the original fiber;

That the following demonstrates such fact:

Experiment

The invention disclosed in Endo et al. is a phosphorus-containing polyester, and only Example 10 and Example 11 disclose production of the fiber. Since Example 10 provides detailed description, Example 10 was reproduced.

First, based on the description of Preparation 9 and Example 10, a flame retardant and a polymer were prepared (produced according to the step described in Endo et al). The flame retardant obtained by reproducing Preparation 9 was a yellow solid having a softening point of 30°C and a phosphorus content of 8.90%, and the polymer obtained by reproducing Example 10 had an intrinsic viscosity of 0.62, whereby production of the flame retardant and the polymer described in Preparation 9 and Example 10 was confirmed. Using these, a fiber was obtained by spinning and drawing under the conditions described in Example 10, and a tricot knitted fabric was prepared. Color tone (b value) of the fiber was 4.5, the result of the measurement of flame-retardance was 5.0 times, the fiber was confirmed to be as described in Example 10. Then, properties of the thus-obtained fiber were measured according to the measurement method described in the present specification.

The following Table 1 shows properties of the fiber, spinning conditions and drawing conditions, which were compared with the properties, spinning conditions and drawing conditions of the fibers obtained in Examples 1, 2, 5 and 7 of the present application. Note that Examples 5, 7 of the present application were the Comparative Examples in the response to the earlier final Office Action.

In this connection, we would note that, in the response to the earlier final Office Action, Example 7 should have been amended to a Comparative Example but Example 6 was amended to a Comparative Example by mistake. Thus, the original Example 6 has been restored and Example 7 has been amended to a Comparative Example by the Amendment submitted at this time.

Table 1

		USP4, 15 7, 436	the present invention			
		Ex. 10	Ex. 1	Ex. 2	Ex. 5 →Comp. Ex.	Ex. 7 →Comp. Ex.
polymer	phosphorus compound	side chain type	side chain type	side chain type	side chain type	side chain type
	phosphorus atom content (ppm)	5188	6000	6000	6000	6000
	intrinsic viscosity	0.62	0.605	0.605	0.605	0.605
spinning conditions	spinning temperature (°C)	285	262	262	262	262
	shear rate (s ⁻¹)	3920	6010	4307	7067	6010
	cooling start distance	35	65	35	65	65
	take-up speed (m/min)	600	1450	1300	1450	1450
drawing conditions	preheating temperature	80	80	80	80	80
	setting temperature	90	160	160	160	145
	draw ratio	4.6	2.79	2.88	3.40	2.79
properties of original fiber	fineness (dtex)	56	167	56	167	167
	number of filaments	24	48	24	48	48
	tanδmax	0.1298	0.2590	0.258	0.253	0.266
	Tα(%)	153.8	129.0	128.8	129.8	128.2
	Δn	0.127	0.120	0.108	0.132	0.101
	SG(g/cm ³)	1.3696	1.3770	1.3772	1.3802	1.3687
	SG- Δn/8.64	1.328	1.337	1.339	1.338	1.332
	strength at break (cN/dtex)	4.60	4.15	4.29	4.46	4.11
	elongation at break(%)	31	32.3	32.7	12.6	32.5
	SHW(%)	15	8.5	8.6	10.2	12.3
	LOI	28.6	29.0	29.1	28.9	29.1
	abrasion resistance (times)	5500	8730	8239	6120	8545
	L value	16.5	15.3	15.2	15.3	15.2
	color fastness to light (grade)	4-5	4-5	4-5	4-5	4-5
	note				Occurrence of nep during knitting	low dimensional stability

Discussion

The fiber of Example 10 of Endo et al was obtained by drawing (draw ratio 4.6) an unoriented yarn obtained at a take-up speed of the melt spun yarn of 600 m/min, and a hot plate temperature of 90°C during drawing. As stated in the previous response, in Example 10 of Endo et al, the take-up speed of the melt spun yarn was too slow and was 600 m/min, and the shear rate was low, which would degrade the strength. To overcome this problem, a high draw ratio of 4.6 was employed to increase the strength. In fact, the strength at break was 4.60 cN/dtex and elongation at break was 31%, thus demonstrating sufficient practical strength. As stated in the previous response, however, to obtain a fiber capable of satisfying all the formulas 1, 2 and 3 in claim 1 of the present application, the fiber should be produced at a comparatively low draw ratio. Since the fiber of Example 10 of Endo et al was obtained at a high draw ratio of 4.6, we concluded that a fiber capable of satisfying all the formulas 1, 2 and 3 in claim 1 of the present application was not obtained. As is clear from the Table, in fact, the fiber of Example 10 of Endo et al did not satisfy any of the formulas 1, 2 and 3 in claim 1 of the present application. The abrasion resistance of the fiber was 5500 times, and as assumed, the fiber was poor in abrasion resistance, and moreover, since the hot plate temperature during drawing was too low (90°C), shrinkage in hot water (SHW) was assumed to exceed 10%. In fact, the shrinkage in hot water (SHW) was 15% and the fiber was poor in heat stability.

From the foregoing results, it is clear that, when the take-up speed is outside the range defined in the present application, a fiber capable of satisfying all the formulas 1, 2 and 3 in claim 1 of the present application (namely, a fiber superior in all the abrasion resistance, heat stability and dyeability) cannot be obtained.

That I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed at Shiga, Japan, this 20th day of May, 2005

Ryouji Nakamura

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Ryouji Nakamura